Amendments to the Claims

Please amend the claims as indicated in the following listing of the claims, which replaces all prior versions of the claims in the application.

1. (Original) A synchronous rectifier control circuit for controlling a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage and includes a primary switch responsive to a switching signal, the control circuit comprising:

a differentiator circuit responsive to the output voltage of the power converter;

a summing circuit responsive to an output of the differentiator circuit and a step function signal;

an integrator circuit responsive to an output of the summing circuit; and

a gate drive circuit responsive to an output of the integrator circuit and the switching signal, the gate drive circuit including an output terminal for coupling to a control terminal of the synchronous rectifier.

2. (Original) The control circuit of claim 1, wherein the gate drive circuit includes two complementary switches.

3. (Original) The control circuit of claim 2, wherein the switches of the gate drive are FETs.

4. (Original) The control circuit of claim 1, further comprising a limiting circuit coupled between the integrator circuit and the gate drive circuit.

5. (Original) The control circuit of claim 1, wherein the switching signal is a pulse width modulated (PWM) signal.

6. (Original) The control circuit of claim 1, wherein the step function signal is synchronized with the switching signal.

7. (Original) The control circuit of claim 1, wherein the synchronous rectifier includes a MOSFET.

8. (Original) A synchronous rectifier control circuit for controlling a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage and includes a primary switch responsive to a switching signal, the control circuit comprising:

a differentiator circuit having an input terminal responsive to the output voltage of the power converter;

a summing circuit having a first input terminal coupled to an output terminal of the differentiator circuit and having a second input terminal responsive to a step function signal;

an integrator circuit having an input terminal coupled to an output terminal of the summing circuit; and

a gate drive circuit having a first input terminal coupled to an output of the integrator circuit, having a second input terminal responsive to the switching signal, and having an output terminal for coupling to a control terminal of the synchronous rectifier.

9. (Original) The control circuit of claim 8, wherein the gate drive circuit includes two complementary switches.

10. (Original) The control circuit of claim 9, wherein the switches of the gate drive are FETs.

11. (Original) The control circuit of claim 8, further comprising a limiting circuit, wherein the limiting circuit includes an input terminal coupled to the output terminal of the integrator circuit and includes an output terminal coupled to the first input terminal of the gate drive circuit.

12. (Original) The control circuit of claim 8, wherein the switching signal is a pulse width modulated (PWM) signal.

13. (Original) The control circuit of claim 8, wherein the step function signal is synchronized with the switching signal.

14. (Original) The control circuit of claim 8, wherein the synchronous rectifier includes a MOSFET.

15. (Original) A control circuit for a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage and includes a primary switch responsive to a switching signal, the control circuit comprising:

means for differentiating the output voltage of the power converter;

means for summing the differentiated output voltage and a step function signal to thereby generate a summation signal;

means for integrating the summation signal; and

means for activating the synchronous rectifier based on the integrated summation signal and the switching signal.

16. (Original) The control circuit of claim 15, further comprising means for limiting the integrated summation signal.

17. (Original) The control circuit of claim 15, wherein the switching signal is a pulse width modulated (PWM) signal.

18. (Original) The control circuit of claim 15, wherein the step function signal is synchronized with the switching signal.

19. (Original) A power converter for producing an output voltage, comprising:

a switching control circuit for producing a switching signal;

a primary switch responsive to the switching signal;

a synchronous rectifier; and

a synchronous rectifier control circuit including:

a differentiator circuit responsive to the output voltage of the power converter;

a summing circuit responsive to an output of the differentiator circuit and a step function signal;

an integrator circuit responsive to an output of the summing circuit; and

a gate drive circuit responsive to an output of the integrator circuit and the switching signal and including an output terminal coupled to a control terminal of the synchronous rectifier.

20. (Original) The power converter of claim 19, wherein the gate drive circuit includes two complementary switches.

21. (Original) The power converter of claim 20, wherein the switches of the gate drive are FETs.

22. (Original) The power converter of claim 19, wherein the control circuit further comprises a limiting circuit, wherein the limiting circuit is coupled between the integrator circuit and the gate drive circuit.

23. (Original) The power converter of claim 19, wherein the switching signal is a pulse width modulated (PWM) signal.

24. (Original) The power converter of claim 19, wherein the step function signal is synchronized with the switching signal.

25. (Original) The power converter of claim 19, wherein the synchronous rectifier includes a MOSFET.

26. (Original) The power converter of claim 19, wherein the power converter is one of a forward converter, a flyback converter and a buck converter.

27. (Original) The power converter of claim 19, further comprising a transformer and wherein:

the primary switch is coupled to a primary winding of the transformer; and

the synchronous rectifier is coupled to a secondary winding of the transformer.

28. (Original) The power converter of claim 27, wherein the transformer transfers energy from the primary winding to the secondary winding during the ON period of the primary switch.

29. (Original) The power converter of claim 27, wherein the transformer stores energy from the primary winding during the ON period of the primary switch.

30. (Original) The power converter of claim 19, wherein:

the power converter is an interleaved converter including a second synchronous rectifier; and

the synchronous rectifier control circuit includes a second gate drive circuit responsive to the output of the integrator circuit and the switching signal, the gate drive circuit further including an output terminal coupled to a control terminal of the second synchronous rectifier.

31. (Original) The power converter of claim 19, further comprising an inverter coupled between the switching control circuit and the synchronous rectifier control circuit.

32. (Original) A method of controlling a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage and includes a primary switch responsive to a switching signal, the method comprising:

differentiating the output voltage of the power converter;

summing the differentiated output voltage and a step function signal to thereby generate a summation signal;

integrating the summation signal; and

activating the synchronous rectifier based on the integrated summation signal and the switching signal of the power converter.

33. (Original) The method of claim 32, further comprising limiting the integrated summation signal.

34. (Original) The method of claim 32, wherein the switching signal is a pulse width modulated (PWM) signal.

35. (Original) The method of claim 32, wherein the step function signal is synchronized with the switching signal.

36. A method of controlling a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage, the method comprising:

differentiating the output voltage of the converter; and

~~controlling~~ modulating the amplitude of the gate voltage of the synchronous rectifier to thereby control conduction of the synchronous rectifier in proportion to the differentiated output voltage.

37. The method of claim 36, wherein ~~the controlling conduction~~ modulating the amplitude of the gate voltage of the synchronous rectifier includes increasing the rate of increase of ~~a voltage level of a control signal to the synchronous rectifier~~ the gate voltage if the output voltage is monotonic and rising.

38. The method of claim 37, wherein ~~the controlling conduction~~ modulating the amplitude of the gate voltage of the synchronous rectifier further includes decreasing the rate of increase of the gate voltage ~~level of the control signal to the synchronous rectifier~~ if the output voltage is non-monotonic.

39. A method of controlling a synchronous rectifier of a power converter, wherein the power converter is for producing an output voltage, the method comprising:

differentiating the output voltage of the converter;

modulating the amplitude of the gate voltage of the synchronous rectifier based on the differentiated output voltage to reduce second quadrant current through the synchronous rectifier.

40. The method of claim 39, wherein modulating the synchronous rectifier includes decreasing the rate of increase of the gate voltage ~~level of a control signal to the synchronous rectifier~~ when the output voltage is non-monotonic.